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INFANT DEATH: SOCIODEMOGRAPHIC AND MEDICAL RISK FACTOR ANALYSES FOR NORTH CAROLINA

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ABSTRACT

Between 1977-81 and 1988-91, reductions in fetal and neonatal mortality were greater for whites than nonwhites, while nonwhites experienced a greater decline in postneonatal death. This occurred as whites experienced a 26 percent **increase** in the postneonatal death rate of infants weighing 1500-2499 grams at birth.

The size and mix of North Carolina's birth population also changed considerably during those years with large increases in the numbers of unmarried and older mothers. Simultaneously, shifts occurred in the relative risks associated with several sociodemographic factors.

As a result of the 1988 expansion of data gathered on the North Carolina birth certificate, this report examines associations between a poor pregnancy outcome and selected medical conditions of the mother. Inadequate prenatal care, low weight gain, and complications of labor and delivery are strong risk factors. Deficient reporting of maternal health conditions will be addressed in the future by linking birth certificates with hospital discharge records.

This descriptive study needs to be followed by multivariate analyses to assess the independent effects of the various demographic, behavioral, and medical factors that seem to make a difference in pregnancy outcome. Based on those results, it is recommended that attributable risk analyses also be performed to assess the potential proportional reduction in overall infant mortality that could be achieved by modifying certain risk factors.



NORTH CAROLINA DEPARTMENT OF ENVIRONMENT, HEALTH, AND NATURAL RESOURCES

INTRODUCTION

North Carolina has a history of high infant mortality. In response to that general trend and to the state's particularly high rate in 1988, Governor James G. Martin created on December 13, 1989, the Governor's Commission on Reduction of Infant Mortality. The legislature followed with sizable appropriations to combat the problem.

The state's infant mortality rate dropped in 1992 to 9.9, the lowest in the state's history. Still, more than 1,000 babies died during their first year of life, and nearly 1,000 more were stillborn after 20 weeks gestation.

One means of saving the lives of more infants is to ensure that *all* women, and particularly those identified as being at high risk, receive appropriate and accessible prenatal care. The data of this report should prove useful for identifying groups at high risk for infant death as a basis for targeting intervention programs.

BACKGROUND FOR PRESENT REPORT

For many years, North Carolina has collected information on birth certificates about maternal characteristics that are known risk factors for fetal, neonatal, and postneonatal death. These sociodemographic risk factors include young and old age, low educational level, unmarried, high birth order, a previous pregnancy termination, or a child born alive who is now dead.¹ These factors may be ascertained as early as a woman's first prenatal care visit.

Since 1972, the State Center has routinely produced (triennially, then annually) state, region, county, and hospital-specific tables showing live births and corresponding fetal, neonatal, and postneonatal deaths and death rates according to birthweight and the various maternal characteristics associated with risk. Due to rising publication and distribution costs, these data are no longer distributed except by special request.

In 1988, a new birth certificate was implemented. Items were added and some existing ones revised to obtain new and better information on demographic, behavioral, and medical factors influencing fertility and pregnancy outcomes. The purpose was to provide better data for planning and evaluating maternal and child health programs.²

The present report is the State Center's first analysis of the statewide data since a report was last

published in 1988 (1986 data). The purpose is three-fold: 1) to examine changes in birthweight-specific fetal, neonatal, and postneonatal mortality over the past decade; 2) to see if the traditional maternal risks are changing and how; and 3) to measure the association between a poor pregnancy outcome and selected new items on the birth certificate. The latter aspect is made possible by the recent availability of four years of the new birth certificate data (1988-91) so that more stable mortality estimates are possible.

In considering the results of this study, the reader should keep in mind that the risk factors are often *markers* for infant mortality, not necessarily causes. Birth to an unwed mother, for example, does not cause infant death; rather, associated factors such as socioeconomic status, stress, and lack of medical care are among the underlying causes of higher infant death rates among unmarried mothers. Marital status of the mother is thus a surrogate measure for a variety of other related factors for which data are not available. The point is to use available data for targeting resources toward populations most in need.

TECHNICAL NOTES

The definitions and death rate formulas used in this report are given on pages 13 and 14. The reader should note that, in the case of neonatal, postneonatal, and infant deaths, only those matched to a birth certificate are used. Also, the numerator of a death rate is the number of deaths among infants *born during the period of study*. Although 1992 deaths are now available, 1991 is the latest birth year for which infant deaths have been matched to a birth certificate.

Detailed tables for the 1988-91 period are provided in Appendices A and B while text tables are used to highlight changes over the past decade (Tables 1-5) and findings from the analysis of medical risk factors (Tables 6 and 7). Users will note in Tables 1, 3, and 4 that data for an earlier time period are for five years rather than four (in order to use available rates). However, the current and former death rates are directly comparable.

RELATIVE CHANGES IN BIRTHWEIGHT-SPECIFIC MORTALITY

For the two time periods used in this study, Table 1 shows total and birthweight-specific death rates and percent changes by race.

For all birthweights combined, whites experienced the greater percentage reductions in fetal and neonatal

mortality while nonwhites experienced the greater percentage decline in postneonatal death. As a result, the racial gap has narrowed only in the case of postneonatal death where the nonwhite/white death rate ratio has declined about eight percent.

Over the past decade, both whites and nonwhites generally experienced substantial declines in mortality in all birthweight categories. One exception is observed—the postneonatal death rate of white infants weighing 1500-2499 grams increased 26 percent and now exceeds the rate for nonwhites. A possible factor may be, as later shown, a dramatic rise in births to *unmarried* white women. These women appear vulnerable to postneonatal loss.

Further examining Table 1, lower nonwhite than white death rates are observed in the case of fetal mortality under 1500 grams and neonatal and postneonatal mortality at 1500-2499 grams. A possible explanation is that, compared to whites, low-weight nonwhite

infants tend to be of higher gestational age with greater survival potential.

Among normal-birthweight infants (2500+ grams), declines in white and nonwhite mortality have been about equal. The nonwhite postneonatal death rate remains especially high among these higher-weight infants.

As these changes have occurred, it is noteworthy that the percentage of newborns weighing under 2500 grams changed very little between 1977-81 and 1988-91. It remained unchanged at 6.1 for whites while rising from 11.9 to 12.4 for nonwhites.

Except for postneonatal mortality among higher-weight infants, the birthweight-specific death rates of white and nonwhite infants are not very different (Table 1). Thus, it is the continued two-fold increased rate of low-weight births that contributes to much of the overall higher rate of infant death among nonwhites.

TABLE 1
Fetal, Neonatal, and Postneonatal Death Rates with Percent Changes
by Race and Birthweight
North Carolina 1977-81 and 1988-91

Birthweight (Grams)	Death Rate	Whites			Nonwhites		
		1977-81*	1988-91	Percent Change	1977-81*	1988-91	Percent Change
TOTAL	Fetal	8.6	6.6	-23.3	15.6	13.0	-16.7
	Neonatal	8.1	5.5	-32.1	14.7	11.8	-19.7
	Postneonatal	3.3	2.8	-15.2	6.5	5.1	-21.5
Under 1500	Fetal	284.1	244.5	-13.9	266.8	219.8	-17.6
	Neonatal	455.8	306.4	-32.8	422.7	318.9	-24.6
	Postneonatal	56.8	38.2	-32.7	74.9	47.5	-36.6
1500-2499	Fetal	30.3	19.4	-36.0	30.8	20.8	-32.5
	Neonatal	27.7	14.1	-49.1	18.2	10.4	-42.9
	Postneonatal	9.2	11.6	+26.1	12.7	9.8	-22.8
2500+	Fetal	3.1	1.8	-41.9	3.7	2.3	-37.8
	Neonatal	2.3	1.4	-39.1	2.6	1.6	-38.5
	Postneonatal	2.6	2.1	-19.2	4.7	3.7	-21.3

*Postneonatal deaths cover only the four years 1978-81.

MATERNAL SOCIODEMOGRAPHIC RISK FACTORS

The analyses below examine race-specific changes in the distribution of live births according to maternal characteristics recorded on the birth certificate and changes in the race-specific fetal, neonatal, and postneonatal mortality risks associated with the maternal risk factors. Detailed tables for the 1988-91 period are provided in Appendix A, where a fifth table combines the neonatal and postneonatal deaths to present data for total infant deaths. This infant death table was not available before 1988-91.

Live Births

Between 1981 and 1991, the number of white and nonwhite live births each rose about 22 percent, to 69,233 and 33,076 respectively. These were among the highest numbers recorded in North Carolina since 1964. At the same time, the crude birth rates increased for both race groups, by seven percent for whites and by 10 percent for nonwhites.

The 1981-1991 numerical increase in live births involved all sociodemographic categories of births except nonwhite mothers of low education, married non-

white mothers, and white and nonwhite mothers who previously had a live born child who died.

In the face of these numerical increases, what has happened to the percentages of births according to maternal age, marital status, and other factors that influence birth outcome? For each of the eight risk factors previously identified, Table 2 examines the race-specific changes.

For each race group, the percentage of mothers having one or more of the eight risk factors increased over the 1981-91 decade, due in part to the increase in births to unmarried women. The percentage unwed more than doubled for whites while rising by more than one-third for nonwhites. These increases may be explained by an increasing birth rate among unmarried women, an increasing number of unmarried women in the population, or a combination of these factors.

For each race group, the percentage of births to older mothers also rose substantially between 1981 and 1991, more than doubling among white mothers. As a result, older age is found to be more prevalent among whites (8%) than nonwhites (5%).

TABLE 2
Percentage of Live Births in Each Risk Group with Percent Changes
by Race and Maternal Risk Factor
North Carolina 1981 and 1991

<u>Risk Factor</u>	<u>Whites</u>			<u>Nonwhites</u>		
	<u>1981</u>	<u>1991</u>	<u>Percent Change</u>	<u>1981</u>	<u>1991</u>	<u>Percent Change</u>
Age under 18 years	4.9	4.2	-14.3	11.9	10.5	-11.8
Age 35 or more years	3.8	8.1	+113.2	3.6	5.0	+38.9
Education under 9 years	3.9	3.6	-7.7	4.8	3.4	-29.2
Education 9-11 years	20.3	16.6	-18.2	31.6	26.1	-17.4
Unmarried	6.5	16.0	+146.2	46.4	64.2	+38.4
Birth Order 4 or more	9.1	12.8	+40.7	17.3	20.2	+16.8
Previous Pregnancy Termination*	—	24.6	—	—	27.0	—
Previous Live Born Now Dead	2.0	1.5	-25.0	3.7	2.2	-40.5
One or more of above	42.9	52.5	+22.4	72.2	81.9	+13.4
Total Live Births	56,756	69,233	+22.0	26,996	33,076	+22.5

*See Operational Definitions, page 13. Prior to 1988, induced abortions were not reportable in previous pregnancy termination, so the 1981 data and percent changes are omitted.

For each race group, percentages for birth order 4 or more also rose between 1981 and 1991. These increases occurred largely since implementation of the new birth certificate in 1988 and thus may partly represent a reporting artifact. Whereas induced abortions formerly were not reportable in pregnancy history, the new certificate asks for the numbers of previous live births and "other terminations," the latter to include "spontaneous and induced at any time after conception." As a result, data on previous pregnancy termination and birth order are not strictly comparable between the time periods examined in this report.

Meanwhile, the white and nonwhite percentages for young age, low education, and previous live born now dead (PLBND) all declined over the last decade. The finding for PLBND may relate directly to some later results of this study.

Note: Since fetal deaths represent only about 0.7 percent of white deliveries and 1.3 percent of nonwhite deliveries, the above changes in the maternal characteristics of "live births" may be considered to apply to "deliveries" as well.

Birth Outcomes

Tables A.2 - A.4 of Appendix A show by race and maternal characteristic the state's 1988-91 fetal, neonatal, and postneonatal death rates. Based on these rates and corresponding rates from a decade ago, Tables 3-5 of the text compare relative risks and those changes over time for the sociodemographic risk factors. The relative risk (RR) is the death rate among mothers with a given risk factor divided by the death rate for mothers without the risk factor (the "referent" group) as specified in table notes. It is an indicator of the strength of the association between the risk factor and subsequent mortality.

From Tables 3-5, these major findings are apparent:

Fetal Mortality (Table 3)

- For each race group, the relative risk of fetal death among mothers aged 35+ has declined, although older age is still a strong risk factor for nonwhite fetal death.
- Among whites, the RR for age under 18 has increased.

TABLE 3
Relative Risk of Fetal Death¹ with Percent Changes
by Race and Maternal Risk Factor
North Carolina 1977-81 and 1988-91

Risk Factor	Whites			Nonwhites		
	1977-81	1988-91	Percent Change	1977-81	1988-91	Percent Change
Age under 18 years ²	1.29	1.60	+24.0	1.16	1.08	-6.9
Age 35 or more years ²	1.88	1.31	-30.3	1.89	1.59	-15.9
Education under 9 years ³	1.57	1.75	+11.5	1.27	1.16	-8.7
Education 9-11 years ³	1.32	1.23	-6.8	1.05	1.04	-1.0
Unmarried ⁴	1.66	1.62	-2.4	1.24	1.31	+5.6
Birth Order 4 or more ⁵	1.21	1.23	+1.7	1.19	1.08	-9.2
Previous Pregnancy Termination ⁶	—	1.42	—	—	1.41	—
Previous Live Born Now Dead ⁷	1.58	4.50	+184.8	1.61	3.43	+113.0
One or more of above ⁸	1.53	1.75	+14.4	1.58	1.65	+4.4

¹Relative risk is the death rate for a risk factor divided by the death rate for a referent group, for example, death rates for mothers under 18 and 35 or more are each divided by the death rate for mothers 18-34.

²Referent group - mothers aged 18-34.

³Referent group - education 12+ years.

⁴Referent group - married mothers.

⁵Referent group - birth order = 1.

⁶Referent group - no previous pregnancy termination. Data for 1977-81 are not comparable.

⁷Referent group - no previous live born now dead.

⁸Referent group - none of the above risk factors.

- The RR for mothers with a previous live born infant now dead has increased substantially, making it the strongest risk factor for fetal death.
- For nonwhites, the RR for birth order 4 or more has declined.

Neonatal Mortality (Table 4)

- For whites, the relative risk of neonatal death among mothers with education under 9 years has increased.
- For nonwhites, the relative risks associated with older age and high birth order have risen.
- For both race groups, the RR for history of a previous live born infant now dead has increased, making it the strongest risk factor.

Postneonatal Mortality (Table 5)

- For both races in 1978-81, the relative risk for mothers aged 35+ was lower than that for mothers aged 18-34. In 1988-91, however, there was essentially no difference in risk between the two groups.
- For whites, the RR for mothers with education under 9 years or history of a previous live born infant now dead has declined.
- For nonwhites, the RR associated with birth order 4 or more or history of a previous live born infant now dead has increased.
- Low education remains a strong risk factor for post-neonatal death for both race groups, as do unmarried, young maternal age, and high birth order among whites. Among nonwhites, history of a previous live born infant now dead and high birth order are strong risk factors.

TABLE 4
Relative Risk of Neonatal Death¹ with Percent Changes
by Race and Maternal Risk Factor
North Carolina 1977-81 and 1988-91

<u>Risk Factor</u>	<u>Whites</u>			<u>Nonwhites</u>		
	<u>1977-81</u>	<u>1988-91</u>	<u>Percent Change</u>	<u>1977-81</u>	<u>1988-91</u>	<u>Percent Change</u>
Age under 18 years ²	1.73	1.85	+6.9	1.25	1.24	-0.8
Age 35 or more years ²	1.27	1.10	-13.4	1.01	1.36	+34.7
Education under 9 years ³	1.51	1.71	+13.2	1.34	1.42	+6.0
Education 9-11 years ³	1.43	1.49	+4.2	1.12	1.10	-1.8
Unmarried ⁴	1.77	1.72	-2.8	1.21	1.27	+5.0
Birth Order 4 or more ⁵	1.36	1.43	+5.1	1.38	1.71	+23.9
Previous Pregnancy Termination ⁶	—	1.31	—	—	1.64	—
Previous Live Born Now Dead ⁷	3.12	4.21	+34.9	2.60	4.32	+66.2
One or more of above ⁸	1.65	1.62	-1.8	1.57	1.8	+18.5

¹Relative risk is the death rate for a risk factor divided by the death rate for a referent group, for example, death rates for mothers under 18 and 35 or more are each divided by the death rate for mothers 18-34.

²Referent group - mothers aged 18-34.

³Referent group - education 12+ years.

⁴Referent group - married mothers.

⁵Referent group - birth order = 1.

⁶Referent group - no previous pregnancy termination. Data for 1977-81 are not comparable.

⁷Referent group - no previous live born now dead.

⁸Referent group - none of the above risk factors.

TABLE 5
Relative Risk of Postneonatal Death¹ with Percent Changes
by Race and Maternal Risk Factor
North Carolina 1978-81 and 1988-91

Risk Factor	Whites			Nonwhites		
	1978-81	1988-91	Percent Change	1978-81	1988-91	Percent Change
Age under 18 years ²	2.00	1.93	-3.5	1.40	1.18	-15.7
Age 35 or more years ²	.71	1.04	+46.5	.71	1.02	+43.7
Education under 9 years ³	3.46	2.41	-30.3	2.36	1.73	-26.7
Education 9-11 years ³	2.13	2.36	+10.8	2.16	1.55	-28.2
Unmarried ⁴	2.06	1.96	-4.9	1.42	1.41	-0.7
Birth Order 4 or more ⁵	1.57	1.83	+16.6	1.23	1.79	+45.5
Previous Pregnancy Termination ⁶	—	1.19	—	—	1.02	—
Previous Live Born Now Dead ⁷	2.00	1.46	-27.0	1.45	1.90	+31.0
One or more of above ⁸	2.24	2.29	+ 2.2	1.88	1.41	-25.0

¹Relative risk is the death rate for a risk factor divided by the death rate for a referent group, for example, death rates for mothers under 18 and 35 or more are each divided by the death rate for mothers 18-34.

²Referent group - mothers aged 18-34.

³Referent group - education 12+ years.

⁴Referent group - married mothers.

⁵Referent group - birth order = 1.

⁶Referent group - no previous pregnancy termination. Data for 1978-81 are not comparable.

⁷Referent group - no previous live born now dead.

⁸Referent group - none of the above risk factors.

For all outcome groups, the RR associated with being unmarried has changed very little, and it remains a major risk factor for whites only.

By far the greatest change in maternal risk is in the increased RR associated with previous live born infant now dead. For both race groups, it is the strongest risk factor for fetal and neonatal mortality. This occurs as the number and percentage of births in this category have declined. It may be that, following recent reductions in infant mortality, there remains a high-risk group of women among whom repeat fetal and infant mortality is relatively likely. This suggests the need for more intensive preconceptional counseling and risk-appropriate prenatal care among women with previous infant deaths.

MEDICAL RISK FACTORS

In 1992, Buescher³ reported on a 1989 follow-back study to assess the accuracy of data recorded on the North Carolina birth certificate, particularly those data

items added in 1988. A copy of the lower section of the birth certificate, which contains most of the new items, is shown in Appendix C.

Comparing birth certificates to maternal hospital records, results showed that reporting was *very accurate* for birthweight, Apgar score, and method of delivery; *fair to good* for tobacco use, prenatal care, weight gain during pregnancy, obstetrical procedures, and events of labor and delivery; and *poor* for medical history, alcohol use, conditions of the newborn, and congenital anomalies. The report suggested grouping birth certificate items into larger categories (e.g., use trimester rather than exact month prenatal care began) to improve accuracy.

Following deliberations with experts in the maternal and child health field, this report presents tables using a selected set of medical risk factors. These tables are formatted exactly the same as those displaying maternal sociodemographic characteristics and include

the same outcomes (live births and fetal, neonatal, and postneonatal deaths). A fifth table combines the neonatal and postneonatal components to present data for total infant deaths.

The detailed tables for the 1988-91 period are found in Appendix B. Operational definitions and the death rate formulas applied to these data are given on pages 13 and 14.

Live Births

As shown in Table B.1 (Appendix B), nonwhite mothers delivering during 1988-91 appeared more likely than whites to have less-than-adequate prenatal care, to deliver in a Level III hospital, to gain fewer than 15 pounds during pregnancy, and to have anemia. They were somewhat more likely to have one or more medical risk factors and to experience a complication of labor and/or delivery. White mothers, on the other hand, were reportedly more likely to have smoked and to have had diabetes than nonwhites.

In considering the medical conditions data (table items 7-10), the reader should keep in mind that the 1989 follow-back study revealed poor reporting on birth certificates compared to hospital records. Further, hospital records themselves may be incomplete due to late or no prenatal care. Thus, underreporting of medical conditions as well as smoking and use of alcohol may be greater for nonwhites since they are more likely than whites to receive late or no prenatal care.

The finding that a higher percentage of nonwhites deliver in Level III hospitals may be due, in part, to the referral of medically high-risk women to those medical centers through the state's perinatal regionalization program.⁴ Also, nonwhite mothers' greater tendency to gain fewer than 15 pounds may reflect the higher rate of preterm births among nonwhites (less time to gain the weight). An indicator of weight gain appropriate for gestational age would be a better measure, particularly in relation to the mortality results that follow. This matter is discussed under "Weight Gain During Pregnancy" on page 10.

Birth Outcomes

Using the death rates from Tables B.2-B.4 of Appendix B, Table 6 of the text shows relative risks for fetal, neonatal, and postneonatal death by race and category of medical risk. As before, the relative risk

(RR) is the death rate for mothers with a given risk factor divided by the death rate for a referent group as specified in table notes. It is an indicator of the strength of the association between a risk factor and mortality.

From Table 6, the following findings appear most notable:

Fetal Mortality—The Kessner Index for adequacy of prenatal care was not computed for fetal deaths because it is based on gestation and many fetal deaths occur well before delivery.

The relative risk associated with Cesarean delivery appears to suggest a strong protective effect for fetal death among women delivering by C-section. However, this low risk is due to circumstances related to the clinical management of stillborn infants rather than an indication of a causal association.

For both race groups, the strongest risk factor for fetal death is low weight gain, due in part to the gestation and death-to-delivery biases discussed on page 10. Meanwhile, maternal health conditions and complications of labor/delivery are associated with an increased risk of fetal death.

Neonatal Mortality—For both race groups, maternal anemia, diabetes, and hypertension are each associated with RRs of 1.0 or less. Possible explanations are: a) women having these conditions receive overall better prenatal care and/or delivery in a tertiary center, which lead in turn to greater neonatal survival; b) there are other confounding factors such as higher birthweights among infants of diabetic mothers and lower risk of hypertension among smoking mothers; and c) rates based on such small numbers of deaths are subject to large random error. C-section also is shown not to be a risk factor for nonwhite neonatal death.

For both race groups, neonatal mortality appears especially great in the presence of low weight gain, due in part to the gestation bias discussed later in this report. Inadequate prenatal care, the presence of one or more medical conditions, and complications of labor/delivery are also associated with high neonatal mortality risk. As expected from referral patterns, infants born in Level III hospitals also experience high neonatal mortality since a disproportionate number of high-risk babies are delivered in these hospitals. However, it has been shown that neonatal mortality is lower among low-weight infants delivered in Level III hospitals than those born elsewhere.⁵

TABLE 6
Relative Risk of Fetal, Neonatal, and Postneonatal Death¹
by Race and Medical Risk Factor
North Carolina 1988-91

Risk Factor	Whites			Nonwhites		
	Fetal	Neonatal	Postneonatal	Fetal	Neonatal	Postneonatal
Intermediate Prenatal Care ²	N.A.	1.29	1.83	N.A.	.96	1.31
Inadequate Prenatal Care ²	N.A.	2.96	2.78	N.A.	2.35	1.88
Level III Hospital ³	1.18	1.88	1.15	1.06	1.88	1.39
Mother Smoked ⁴	1.32	1.34	2.48	1.21	1.18	1.93
C-Section ⁵	.39	1.36	1.48	.30	.86	1.31
Weight Gain under 15 pounds ⁶	7.90	7.69	1.81	5.11	6.00	1.76
Maternal Anemia ⁷	1.43	1.04	1.71	1.21	.72	1.20
Maternal Diabetes ⁸	1.17	.94	1.11	1.38	.94	.69
Maternal Hypertension ⁹	1.59	.93	1.04	1.59	.65	1.24
Any Maternal Medical Risk Factor ¹⁰	2.12	2.58	1.46	1.81	2.09	1.43
Complication(s) of Labor/Delivery ¹¹	2.44	3.68	1.36	2.33	3.43	1.38

¹Relative risk is the death rate for a risk factor divided by the death rate for a referent group, for example, death rates for mothers with intermediate and inadequate prenatal care are each divided by the death rate for mothers with adequate care.

²Referent group - mothers with adequate prenatal care.

³Referent group - not a Level III hospital.

⁴Referent group - mothers who did not smoke.

⁵Referent group - not a C-Section delivery.

⁶Referent group - weight gain 15 or more pounds.

⁷Referent group - mothers without anemia.

⁸Referent group - mothers without diabetes.

⁹Referent group - mothers without hypertension.

¹⁰Referent group - mothers with no medical risk factor.

¹¹Referent group - mothers without a complication of labor/delivery.

Postneonatal Mortality—Inadequate prenatal care, maternal smoking, and low weight gain are strong risk factors for both white and nonwhite postneonatal death. Intermediate prenatal care is a stronger risk factor for whites than for nonwhites.

Comparisons among the three outcome groups further reveal the following:

- Low weight gain is a much stronger risk factor for fetal and neonatal mortality than for postneonatal death.

- One or more maternal medical risk factors and complications of labor/delivery are associated especially with an increased risk for both fetal and neonatal death.
- Delivery at a Level III hospital is associated with a greater likelihood of neonatal than of fetal or postneonatal death.
- Maternal smoking is more strongly associated with postneonatal death than with fetal or neonatal death.

Weight Gain During Pregnancy

Since fetal and infant deaths are often associated with preterm delivery, those mothers would have less chance than others to gain 15 pounds. Thus, Item 6 of the Appendix B tables should be modified to reflect the gestation-specific *adequacy* of weight gain rather than total weight gain. Even then, the fetal death rate for inadequate gain may be biased upward due to a time lag between fetal death and delivery during which a woman may be unlikely to gain additional weight.

From the Institute of Medicine, the chart of Appendix D shows recommended levels of weight gain for normal-weight women. Applying these criteria to the 1988-91 statewide data, Table 7 shows the relative risks for fetal, neonatal, and postneonatal mortality among mothers whose weight gain was less than adequate. Less-than-adequate gain is clearly a risk factor for fetal and neonatal death, although this relative risk is much smaller than that for weight gain under 15 pounds (Table 6), due to the adjustment for gestational age.

Notes: 1) Due to cases of unknown weight gain or unknown/improbable gestation, the percentage of births with unknown adequacy of weight gain is high—six percent for whites and eight percent for nonwhites. Among these births, the death rates are very high.

2) The recommended weight gain at term is 25 pounds. Under 15 pounds is used here as a very high-risk category.

MAJOR FINDINGS

- The postneonatal death rate of white infants weighing 1500-2499 grams at birth has increased, but the numerical increase is only 32 deaths more than expected during the 1988-91 period (applying the 1977-81 death rate).
- Fetal mortality under 1500 grams and neonatal and postneonatal mortality at 1500-2499 grams are higher for whites than nonwhites.
- For both race groups, the percentage of newborns weighing under 2500 grams has changed very little over the last decade.
- The number of white and nonwhite live births each rose about 22 percent between 1981 and 1991 with large increases among unwed and older mothers. The number and percentage of mothers with history of a previous live born now dead declined.
- Following some rather substantial changes in the relative risk associated with several sociodemographic risk factors, maternal history of a previous live born now dead is now the strongest risk factor for fetal and neonatal mortality and nonwhite postneonatal mortality.
- Low education is strongly associated with both white and nonwhite postneonatal mortality.

TABLE 7

Relative Risk of Fetal, Neonatal, and Postneonatal Death*
by Race and Weight Gain
North Carolina 1988-91

<u>Weight Gain</u>	<u>Whites</u>			<u>Nonwhites</u>		
	<u>Fetal</u>	<u>Neonatal</u>	<u>Postneonatal</u>	<u>Fetal</u>	<u>Neonatal</u>	<u>Postneonatal</u>
Less than Adequate	2.33	2.31	1.64	1.96	1.88	1.46

*Relative risk is the death rate for mothers with less than adequate weight gain divided by the death rate for mothers with adequate weight gain. Adequate gain is the range denoted by the minimum and maximum amounts of Appendix D.

- Although the number and percentage of births to unmarried mothers has increased for both race groups, the relative risk for this factor has changed little. It remains a strong risk factor for whites only.
- Based on 1988-91 birth certificates, nonwhite mothers tend to have medical risk factors more often than do white mothers. Exceptions are that white mothers are reportedly more likely to smoke and to have diabetes than nonwhites.
- Inadequate prenatal care and less-than-adequate weight gain during pregnancy are strongly associated with both white and nonwhite mortality.
- The presence of one or more maternal medical risk factors and complications of labor/delivery are generally strong risk factors. Taken alone, however, maternal anemia, diabetes, and hypertension were not associated with an increased risk for neonatal mortality.
- Maternal smoking is strongly associated with white and nonwhite postneonatal mortality.

DISCUSSION

The size and mix of North Carolina's annual birth population has changed considerably over the past decade to include more births in most sociodemographic categories. As these changes have occurred, the relative risk for infant mortality associated with some of these factors has also changed.

Despite this, all eight of the traditional sociodemographic risk factors are still associated with elevated risk of fetal, neonatal, and/or postneonatal loss. Likewise, for one or more of these types of deaths, the medical risk factors examined in this study are associated with elevated risk.

A concern arising from this study is the recent increase in the postneonatal mortality of white infants weighing 1500-2499 grams at birth. A special study of the factors surrounding this increase may not be warranted because of the small numbers involved; however, it should be noted that being unmarried remains a major risk factor for white postneonatal death and births to unmarried white mothers are increasing. The number nearly tripled while the percentage more than doubled between 1981 and 1991.

In a 1985 study of the sociodemographic risk factors,⁶ Symons expressed concern for the rising trend in births to older white women, older age being a strong risk factor for fetal mortality. By the current time, however, the mix of older white mothers appears to have changed since older age is now associated with only a 30 percent increase in risk among whites.

Based on a previous study³ and some current results, the reporting of maternal health conditions on birth certificates may be poor. In order to improve the quality of these data, the State Center is planning to link birth certificates to hospital discharge records. Deficient reporting will still occur in some cases, however. For example, late or no prenatal care and other intervening factors may prevent accurate reporting of this information on computerized maternal hospital records.

Another word of caution is that the death rates and relative risks in this report may over- or under-state the true magnitude of risk for an individual factor since other variables are not simultaneously controlled. For example, the infant death rate is lower for women with "adequate" prenatal care, but not all of this difference is due to prenatal care *per se*. Women with adequate prenatal care are also at lower risk, on average, for other factors associated with infant death. Multivariate analyses are needed to better assess the independent effect of individual risk factors.

It is also important to note that the number of deaths associated with a risk factor is sometimes small. For example, among infants born in 1991, only 60 out of 715 neonatal deaths (8%) involved a maternal history of previous live born now dead; only 10 out of 339 postneonatal deaths (3%) involved maternal anemia. Thus, mortality reductions in a particular high-risk category may only minimally affect the statewide death rate. A measure known as "attributable risk" combines the relative risk with the prevalence of the risk factor to determine the proportion of the adverse outcome that is attributable to an exposure (such as a risk factor).⁷ It is recommended that attributable risk analyses be applied to the results of the multivariate analyses suggested above in order to assess the "public health significance" of each risk factor.

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- (4) N.C. Department of Human Resources, Maternal and Child Care Section. "Guidelines—North Carolina Perinatal Care Program." July 1984.
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- (6) N.C. Department of Human Resources, State Center for Health Statistics. "Maternal and Child Health Statistics in North Carolina, 1969-73 through 1979-83," *SCHS Studies*, No. 36. July 1985.
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OPERATIONAL DEFINITIONS (in alphabetical order)

Birth Order: The sum of mother's previous live births and still births (any gestational age) plus one for the present birth. Effective with the 1988 revised birth certificate, previous induced abortions are included.

C-Section: Response 03 or 04 (primary or repeat Cesarean section) in Item 41 of the birth certificate (Appendix C).

Complications of Labor and/or Delivery: Any response except 00 (None) in Item 40 of the birth certificate (Appendix C).

Fetal Death: Death prior to complete expulsion or extraction from its mother of the product of conception. This report shows only registered fetal deaths (stillbirths) of 20 or more weeks gestation that were not recorded as induced abortions.

Hospital Level: The state's Perinatal Care Program classifies hospitals into three levels of care, Level III being the highest. Levels are based on such determinants as staffing complement, equipment, ancillary services, and facilities available for perinatal purposes. There are no Level III military and federal hospitals. Level III hospitals are also referred to as tertiary centers.

Infant Death: Death of a liveborn child under one year of age (neonatal plus postneonatal deaths).

Live Birth: The complete expulsion or extraction from its mother of a product of human conception, irrespective of the duration of pregnancy, which after such expulsion or extraction, breathes or shows any other evidence of life, whether or not the umbilical cord has been cut.

Maternal Anemia: Response 01 in Item 38a of the birth certificate (Appendix C).

Maternal Diabetes: Response 04 in Item 38a of the birth certificate (Appendix C).

Maternal Hypertension: Response 08 or 09 (chronic or pregnancy-associated hypertension) in Item 38a of the birth certificate (Appendix C).

Maternal Medical Risk Factors: Any response except 00 (None) in Item 38a of the birth certificate (Appendix C).

Mother Smoked: Based on "Yes" response to "tobacco use during pregnancy" in Item 38b of the birth certificate (Appendix C).

Neonatal Death: Death of a liveborn child under 28 days of age.

Postneonatal Death: Death of a liveborn child of 28 days to one year of age.

Prenatal Care: The categorical index of a woman's quantity of prenatal care (Kessner Index) is based on three variables:

1. Trimester of first prenatal visit
2. Number of prenatal visits
3. Number of weeks gestation at delivery

Criteria used to determine a woman's adequacy of prenatal care participation are available from the State Center.

Previous Pregnancy Termination: One or more previous abortions or stillborn infants (any gestational age). This includes induced abortions since 1988.

Unmarried: Mother has never been legally married or has been widowed or legally divorced for longer than 280 days at the time of delivery.

Weight Gain: Number of pounds reported in Item 38b of the birth certificate (Appendix C).

FORMULAS FOR THE DEATH RATES

Mortality measures are calculated by the formulas below. **The numerator is the number of deaths among infants born during the four-year period.**

$$\begin{array}{lcl} \text{Four-year fetal} & & \text{Four-year number of fetal deaths} \\ \text{mortality risk} & = & \text{-----} \quad \text{X 1,000} \\ \text{(death rate)} & & \text{Four-year number of live births plus} \\ & & \text{the four-year number of fetal deaths} \end{array}$$

$$\begin{array}{lcl} \text{Four-year} & & \text{Four-year number of neonatal deaths} \\ \text{neonatal} & = & \text{-----} \quad \text{X 1,000} \\ \text{mortality risk} & & \text{Four-year number of live births} \\ \text{(death rate)} & & \end{array}$$

$$\begin{array}{lcl} \text{Four-year} & & \text{Four-year number of postneonatal deaths} \\ \text{postneonatal} & = & \text{-----} \quad \text{X 1,000} \\ \text{mortality risk} & & \text{Four-year number of live births minus} \\ \text{(death rate)} & & \text{the four-year number of neonatal deaths} \end{array}$$

$$\begin{array}{lcl} \text{Four-year} & & \text{Four-year number of infant deaths} \\ \text{infant} & = & \text{-----} \quad \text{X 1,000} \\ \text{mortality risk} & & \text{Four-year number of live births} \\ \text{(death rate)} & & \end{array}$$

APPENDIX A

TABLE A.1

ANNUAL AND FOUR-YEAR LIVE BIRTHS

1991 AND 1988-91

NORTH CAROLINA

RESIDENT LIVE BIRTHS	TOTAL			WHITE			NONWHITE		
	ANNUAL NUMBER	MULTI-YEAR NUMBER	RATE*	ANNUAL NUMBER	MULTI-YEAR NUMBER	RATE*	ANNUAL NUMBER	MULTI-YEAR NUMBER	RATE*
1. TOTAL	102309	406399	100.0	69233	274720	100.0	33076	131679	100.0
OCCUR. IN STATE	101115	401540	98.8	68289	270843	98.6	32826	130697	99.3
OCCUR. OUT OF STATE	1194	4859	1.2	944	3877	1.4	250	982	0.7
2. BIRTHWEIGHT									
UNDER 1500 GRAMS	1713	6682	1.6	756	2944	1.1	957	3738	2.8
1500-2499 GRAMS	6902	26391	6.5	3669	13785	5.0	3233	12606	9.6
2500+ GRAMS	93628	372959	91.8	64775	257775	93.8	28853	115184	87.5
UNKNOWN	66	367	0.1	33	216	0.1	33	151	0.1
MATERNAL CHARACTERISTICS									
3. AGE									
UNDER 16 YEARS (A)	6399	25126	6.2	2926	11354	4.1	3473	13772	10.5
18-34 YEARS	88541	353419	87.0	60620	242295	88.2	27921	111124	84.4
35+ YEARS (B)	7235	26230	6.5	5581	19847	7.2	1654	6383	4.8
UNKNOWN	134	1624	0.3	106	1224	0.5	28	400	0.3
4. EDUCATION									
UNDER 9 YEARS (C)	3583	13655	3.4	2467	9087	3.3	1116	4568	3.5
9-11 YEARS (D)	20141	79829	19.6	11498	45696	16.6	8645	34133	25.9
12+ YEARS	78422	312276	76.8	55177	219592	79.9	23245	92684	70.4
UNKNOWN	163	639	0.2	91	345	0.2	72	294	0.2
5. UNMARRIED									
YES (E)	32327	116948	28.8	11088	37402	13.6	21239	79546	60.4
NO	69968	289413	71.2	58136	237294	86.4	11832	52119	39.6
UNKNOWN	14	38	0.0	9	24	0.0	5	14	0.0
6. BIRTH ORDER									
1	36197	147601	36.3	25848	104897	38.2	10349	42704	32.4
2-3	50440	199942	49.2	34442	136454	49.7	15998	63488	48.2
4+ (F)	15534	58165	14.3	8864	32938	12.0	6670	25227	19.2
UNKNOWN	138	691	0.2	79	431	0.1	59	260	0.2
7. PREVIOUS PREGNANCY TERMINATION									
YES (G)	25960	96921	23.8	17044	63760	23.2	8916	33161	25.2
NO	76281	309082	76.1	52151	210711	76.7	24130	98371	74.7
UNKNOWN	68	396	0.1	38	249	0.1	30	147	0.1
8. PREVIOUS LIVE BORN NOW DEAD									
YES (H)	1741	7467	1.8	1011	4254	1.5	730	3213	2.4
NO	100476	398510	98.1	68168	270209	98.4	32308	128301	97.4
UNKNOWN	92	422	0.1	54	257	0.1	38	165	0.2
9. ANY ONE OR MORE									
(OFF A THRU H)	63433	242021	59.6	36354	137408	50.0	27079	104613	79.4

* SEE DEFINITIONS AND FORMULAS.

DEPT. OF ENVIRONMENT, HEALTH, AND NATURAL RESOURCES
 STATE CENTER FOR HEALTH AND ENVIRONMENTAL STATISTICS
 PO BOX 29538, RALEIGH, N.C. 27626-0538

TABLE A.2

ANNUAL AND FOUR-YEAR FETAL DEATHS

1991 AND 1988-91

NORTH CAROLINA

RESIDENT FETAL DEATHS	TOTAL			WHITE			NONWHITE		
	ANNUAL NUMBER	MULTI-YEAR NUMBER	RATE*	ANNUAL NUMBER	MULTI-YEAR NUMBER	RATE*	ANNUAL NUMBER	MULTI-YEAR NUMBER	RATE*
1. TOTAL	884	3566	8.7	465	1826	6.6	419	1740	13.0
OCCUR. IN STATE	873	3520	-	460	1803	-	413	1717	-
OCCUR. OUT OF STATE	11	46	-	5	23	-	6	23	-
2. BIRTHWEIGHT									
UNDER 1500 GRAMS	531	2006	230.9	245	953	244.5	286	1053	219.8
1500-2499 GRAMS	129	541	20.1	69	273	19.4	60	268	20.8
2500+ GRAMS	158	726	1.9	116	464	1.8	42	262	2.3
UNKNOWN	66	293	-	35	136	-	31	157	-
MATERNAL CHARACTERISTICS									
3. AGE									
UNDER 18 YEARS (A)	62	300	11.8	20	114	9.9	42	186	13.3
18-34 YEARS	729	2901	8.1	394	1515	6.2	335	1386	12.3
35+ YEARS (B)	86	290	10.9	49	163	8.1	37	127	19.5
UNKNOWN	7	75	-	2	34	-	5	41	-
4. EDUCATION									
UNDER 9 YEARS (C)	32	162	11.7	23	96	10.5	9	66	14.2
9-11 YEARS (D)	182	779	9.7	75	340	7.4	107	439	12.7
12+ YEARS	620	2458	7.8	349	1318	6.0	271	1140	12.2
UNKNOWN	50	167	-	18	72	-	32	95	-
5. UNMARRIED									
YES (E)	373	1535	13.0	91	375	9.9	282	1160	14.4
NO	510	2028	7.0	373	1450	6.1	137	578	11.0
UNKNOWN	1	3	-	1	1	-	0	2	-
6. BIRTH ORDER									
1	304	1245	8.4	178	677	6.4	126	568	13.1
2-3	399	1612	8.0	211	847	6.2	188	765	11.9
4+ (F)	153	626	10.6	63	263	7.9	90	363	14.2
UNKNOWN	28	83	-	13	39	-	15	44	-
7. PREVIOUS PREGNANCY TERMINATION									
YES (G)	292	1093	11.2	137	540	8.4	155	553	16.4
NO	569	2407	7.7	317	1257	5.9	252	1150	11.6
UNKNOWN	23	66	-	11	29	-	12	37	-
8. PREVIOUS LIVE BORN NOW DEAD									
YES (H)	61	261	33.8	30	122	27.9	31	139	41.5
NO	804	3255	8.1	428	1684	6.2	376	1571	12.1
UNKNOWN	19	50	-	7	20	-	12	30	-
9. ANY ONE OR MORE									
(OF A THRU H)	662	2670	10.9	293	1165	8.4	369	1505	14.2

* SEE DEFINITIONS AND FORMULAS.

TABLE A.3

ANNUAL AND FOUR-YEAR NEONATAL DEATHS

1991 AND 1988-91

NORTH CAROLINA

RESIDENT NEONATAL DEATHS	TOTAL			WHITE			NONWHITE		
	ANNUAL NUMBER	MULTI-YEAR NUMBER	RATE*	ANNUAL NUMBER	MULTI-YEAR NUMBER	RATE*	ANNUAL NUMBER	MULTI-YEAR NUMBER	RATE*
1. TOTAL	715	3050	7.5	347	1499	5.5	368	1551	11.8
BIRTH IN STATE	705	2998	-	341	1463	-	364	1535	-
BIRTH OUT OF STATE	10	52	-	6	36	-	4	16	-
2. BIRTHWEIGHT									
UNDER 1500 GRAMS	472	2094	313.4	202	902	306.4	270	1192	318.9
1500-2499 GRAMS	79	326	12.4	50	195	14.1	29	131	10.4
2500+ GRAMS	144	554	1.5	86	366	1.4	58	188	1.6
UNKNOWN	20	76	-	9	36	-	11	40	-
MATERNAL CHARACTERISTICS									
3. AGE									
UNDER 18 YEARS (A)	59	300	11.9	15	109	9.6	44	191	13.9
18-34 YEARS	606	2507	7.1	303	1258	5.2	303	1249	11.2
35+ YEARS (B)	50	211	8.0	29	114	5.7	21	97	15.2
UNKNOWN	0	32	-	0	18	-	0	14	-
4. EDUCATION									
UNDER 9 YEARS (C)	36	148	10.8	19	76	8.4	17	72	15.8
9-11 YEARS (D)	168	747	9.4	79	332	7.3	89	415	12.2
12+ YEARS	504	2105	6.7	247	1078	4.9	257	1027	11.1
UNKNOWN	7	50	-	2	13	-	5	37	-
5. UNMARRIED									
YES (E)	324	1344	11.5	76	322	8.6	248	1022	12.8
NO	390	1705	5.9	270	1176	5.0	120	529	10.1
UNKNOWN	1	1	-	1	1	-	0	0	-
6. BIRTH ORDER									
1	200	975	6.6	112	561	5.3	88	414	9.7
2-3	340	1404	7.0	173	687	5.0	167	717	11.3
4+ (F)	175	671	11.5	62	251	7.6	113	420	16.6
7. PREVIOUS PREGNANCY TERMINATION									
YES (G)	255	978	10.1	105	429	6.7	150	549	16.6
NO	458	2057	6.7	241	1066	5.1	217	991	10.1
UNKNOWN	2	15	-	1	4	-	1	11	-
8. PREVIOUS LIVE BORN NOW DEAD									
YES (H)	60	243	32.5	22	93	21.9	38	150	46.7
NO	654	2791	7.0	325	1402	5.2	329	1389	10.8
UNKNOWN	1	16	-	0	4	-	1	12	-
9. ANY ONE OR MORE (O F A THRU H)	550	2290	9.5	231	928	6.8	319	1362	13.0

* SEE DEFINITIONS AND FORMULAS.

TABLE A.4

ANNUAL AND FOUR-YEAR POSTNEONATAL DEATHS

1991 AND 1988-91

NORTH CAROLINA

RESIDENT POSTNEONATAL DEATHS	TOTAL			WHITE			NONWHITE		
	ANNUAL NUMBER	MULTI-YEAR NUMBER	RATE*	ANNUAL NUMBER	MULTI-YEAR NUMBER	RATE*	ANNUAL NUMBER	MULTI-YEAR NUMBER	RATE*
1. TOTAL	339	1441	3.6	174	773	2.8	165	668	5.1
BIRTH IN STATE	334	1421	-	170	761	-	164	660	-
BIRTH OUT OF STATE	5	20	-	4	12	-	1	8	-
2. BIRTHWEIGHT									
UNDER 1500 GRAMS	66	199	43.4	29	78	38.2	37	121	47.5
1500-2499 GRAMS	60	279	10.7	31	157	11.6	29	122	9.8
2500+ GRAMS	212	958	2.6	113	537	2.1	99	421	3.7
UNKNOWN	1	5	-	1	1	-	0	4	-
MATERNAL CHARACTERISTICS									
3. AGE									
UNDER 18 YEARS (A)	27	138	5.6	17	58	5.2	10	60	5.9
18-34 YEARS	275	1202	3.4	132	652	2.7	143	550	5.0
35+ YEARS (B)	36	88	3.4	24	56	2.8	12	32	5.1
UNKNOWN	1	13	-	1	7	-	0	6	-
4. EDUCATION									
UNDER 9 YEARS (C)	10	82	6.1	8	48	5.3	2	34	7.6
9-11 YEARS (D)	113	468	5.9	50	238	5.2	63	230	6.8
12+ YEARS	214	886	2.9	115	486	2.2	99	400	4.4
UNKNOWN	2	5	-	1	1	-	1	4	-
5. UNMARRIED									
YES (E)	169	636	5.5	40	182	4.9	129	454	5.8
NO	169	804	2.8	133	590	2.5	36	214	4.1
UNKNOWN	1	1	-	1	1	-	0	0	-
6. BIRTH ORDER									
1	80	405	2.8	52	239	2.3	28	166	3.9
2-3	175	727	3.7	91	398	2.9	84	329	5.2
4+ (F)	84	309	5.4	31	136	4.2	53	173	7.0
7. PREVIOUS PREGNANCY TERMINATION									
YES (G)	95	371	3.9	46	200	3.2	49	171	5.2
NO	243	1065	3.5	127	571	2.7	116	494	5.1
UNKNOWN	1	5	-	1	2	-	0	3	-
8. PREVIOUS LIVE BORN NOW DEAD									
YES (H)	11	46	6.4	6	17	4.1	5	29	9.5
NO	327	1392	3.5	167	755	2.8	160	637	5.0
UNKNOWN	1	3	-	1	1	-	0	2	-
9. ANY ONE OR MORE									
(OF A THRU H)	270	1099	4.6	119	535	3.9	151	564	5.5

* SEE DEFINITIONS AND FORMULAS.

TABLE A.5

ANNUAL AND FOUR-YEAR INFANT DEATHS

1991 AND 1988-91

NORTH CAROLINA

RESIDENT INFANTS DEATHS	TOTAL			WHITE			NONWHITE		
	ANNUAL NUMBER	MULTI-YEAR NUMBER	RATE*	ANNUAL NUMBER	MULTI-YEAR NUMBER	RATE*	ANNUAL NUMBER	MULTI-YEAR NUMBER	RATE*
1. TOTAL	1054	4491	11.1	521	2272	8.3	533	2219	16.9
OCCUR. IN STATE	1039	4419	-	511	2224	-	528	2195	-
OCCUR. OUT OF STATE	15	72	-	10	48	-	5	24	-
2. BIRTHWEIGHT									
UNDER 1500 GRAMS	538	2293	343.2	231	980	332.9	307	1313	351.3
1500-2499 GRAMS	139	605	22.9	81	352	25.5	58	253	20.1
2500+ GRAMS	356	1512	4.1	199	903	3.5	157	609	5.3
UNKNOWN	21	81	-	10	37	-	11	44	-
MATERNAL CHARACTERISTICS									
3. AGE									
UNDER 18 YEARS (A)	86	438	17.4	32	167	14.7	54	271	19.7
18-34 YEARS	881	3709	10.5	435	1910	7.9	446	1799	16.2
35+ YEARS (B)	86	299	11.4	53	170	8.6	33	129	20.2
UNKNOWN	1	45	-	1	25	-	0	20	-
4. EDUCATION									
UNDER 9 YEARS (C)	46	230	16.8	27	124	13.6	19	106	23.2
9-11 YEARS (D)	281	1215	15.2	129	570	12.5	152	645	18.9
12+ YEARS	718	2991	9.6	362	1564	7.1	356	1427	15.4
UNKNOWN	9	55	-	3	14	-	6	41	-
5. UNMARRIED									
YES (E)	493	1980	16.9	116	504	13.5	377	1476	18.6
NO	559	2509	8.7	403	1766	7.4	156	743	14.3
UNKNOWN	2	2	-	2	2	-	0	0	-
6. BIRTH ORDER									
1	280	1380	9.3	164	800	7.6	116	580	13.6
2-3	515	2131	10.7	264	1085	8.0	251	1046	16.5
4+ (F)	259	980	16.8	93	387	11.7	166	593	23.5
7. PREVIOUS PREGNANCY TERMINATION									
YES (G)	350	1349	13.9	151	629	9.9	199	720	21.7
NO	701	3122	10.1	368	1637	7.8	333	1485	15.1
UNKNOWN	3	20	-	2	6	-	1	14	-
8. PREVIOUS LIVE BORN NOW DEAD									
YES (H)	71	289	38.7	28	110	25.9	43	179	55.7
NO	981	4183	10.5	492	2157	8.0	489	2026	15.8
UNKNOWN	2	19	-	1	5	-	1	14	-
9. ANY ONE OR MORE									
(OF A THRU H)	820	3389	14.0	350	1463	10.6	470	1926	18.4

* SEE DEFINITIONS AND FORMULAS.

NAME	GRADE	DATE	LOCATION	REMARKS
1. JAMES EARL RAY	MAJOR	1947-1948	AMERICAN ARMY	
2. JAMES EARL RAY	MAJOR	1949-1950	AMERICAN ARMY	
3. JAMES EARL RAY	MAJOR	1951-1952	AMERICAN ARMY	
4. JAMES EARL RAY	MAJOR	1953-1954	AMERICAN ARMY	
5. JAMES EARL RAY	MAJOR	1955-1956	AMERICAN ARMY	
6. JAMES EARL RAY	MAJOR	1957-1958	AMERICAN ARMY	
7. JAMES EARL RAY	MAJOR	1959-1960	AMERICAN ARMY	
8. JAMES EARL RAY	MAJOR	1961-1962	AMERICAN ARMY	
9. JAMES EARL RAY	MAJOR	1963-1964	AMERICAN ARMY	
10. JAMES EARL RAY	MAJOR	1965-1966	AMERICAN ARMY	
11. JAMES EARL RAY	MAJOR	1967-1968	AMERICAN ARMY	
12. JAMES EARL RAY	MAJOR	1969-1970	AMERICAN ARMY	
13. JAMES EARL RAY	MAJOR	1971-1972	AMERICAN ARMY	
14. JAMES EARL RAY	MAJOR	1973-1974	AMERICAN ARMY	
15. JAMES EARL RAY	MAJOR	1975-1976	AMERICAN ARMY	
16. JAMES EARL RAY	MAJOR	1977-1978	AMERICAN ARMY	
17. JAMES EARL RAY	MAJOR	1979-1980	AMERICAN ARMY	
18. JAMES EARL RAY	MAJOR	1981-1982	AMERICAN ARMY	
19. JAMES EARL RAY	MAJOR	1983-1984	AMERICAN ARMY	
20. JAMES EARL RAY	MAJOR	1985-1986	AMERICAN ARMY	
21. JAMES EARL RAY	MAJOR	1987-1988	AMERICAN ARMY	
22. JAMES EARL RAY	MAJOR	1989-1990	AMERICAN ARMY	
23. JAMES EARL RAY	MAJOR	1991-1992	AMERICAN ARMY	
24. JAMES EARL RAY	MAJOR	1993-1994	AMERICAN ARMY	
25. JAMES EARL RAY	MAJOR	1995-1996	AMERICAN ARMY	
26. JAMES EARL RAY	MAJOR	1997-1998	AMERICAN ARMY	
27. JAMES EARL RAY	MAJOR	1999-2000	AMERICAN ARMY	
28. JAMES EARL RAY	MAJOR	2001-2002	AMERICAN ARMY	
29. JAMES EARL RAY	MAJOR	2003-2004	AMERICAN ARMY	
30. JAMES EARL RAY	MAJOR	2005-2006	AMERICAN ARMY	
31. JAMES EARL RAY	MAJOR	2007-2008	AMERICAN ARMY	
32. JAMES EARL RAY	MAJOR	2009-2010	AMERICAN ARMY	
33. JAMES EARL RAY	MAJOR	2011-2012	AMERICAN ARMY	
34. JAMES EARL RAY	MAJOR	2013-2014	AMERICAN ARMY	
35. JAMES EARL RAY	MAJOR	2015-2016	AMERICAN ARMY	
36. JAMES EARL RAY	MAJOR	2017-2018	AMERICAN ARMY	
37. JAMES EARL RAY	MAJOR	2019-2020	AMERICAN ARMY	
38. JAMES EARL RAY	MAJOR	2021-2022	AMERICAN ARMY	
39. JAMES EARL RAY	MAJOR	2023-2024	AMERICAN ARMY	
40. JAMES EARL RAY	MAJOR	2025-2026	AMERICAN ARMY	

APPENDIX B

TABLE B.1

ANNUAL AND FOUR-YEAR LIVE BIRTHS

1991 AND 1988-91

NORTH CAROLINA

RESIDENT LIVE BIRTHS	TOTAL			WHITE			NONWHITE		
	ANNUAL NUMBER	MULTI-YEAR NUMBER	RATE*	ANNUAL NUMBER	MULTI-YEAR NUMBER	RATE*	ANNUAL NUMBER	MULTI-YEAR NUMBER	RATE*
1. TOTAL	102309	406399	100.0	69233	274720	100.0	33076	131679	100.0
SELECTED RISK FACTORS									
2. PRENATAL CARE									
ADEQUATE	73956	290826	71.6	55615	218739	79.6	18341	72087	54.7
INTERMEDIATE	20941	84226	20.7	10668	43272	15.8	10273	40954	31.1
INADEQUATE	7175	30286	7.5	2820	12110	4.4	4355	18176	13.8
UNKNOWN	237	1061	0.3	130	599	0.2	107	462	0.4
3. HOSPITAL LEVEL									
LEVEL III	36580	157977	38.9	23289	100443	36.6	13291	57534	43.7
OTHER	65729	248422	61.1	45944	174277	63.4	19785	74145	56.3
4. MOTHER SMOKED									
YES	20054	83866	20.6	14855	60989	22.2	5199	22877	17.4
NO	81951	317722	78.2	54194	210334	76.6	27757	107388	81.6
UNKNOWN	304	4811	1.2	184	3397	1.2	120	1414	1.1
5. C-SECTION									
YES	23147	94246	23.2	16051	65014	23.7	7096	29232	22.2
NO	79049	309092	76.1	53113	207531	75.5	25936	101561	77.1
UNKNOWN	113	3061	0.8	69	2175	0.8	44	886	0.7
6. WEIGHT GAIN									
LESS THAN 15 LBS.	8619	32396	8.0	4439	16384	6.0	4180	16012	12.2
15 OR MORE LBS.	90321	351719	86.5	63213	245191	89.3	27608	106528	80.9
UNKNOWN	2869	22284	5.5	1581	13145	4.8	1288	9139	6.9
7. MATERNAL ANEMIA									
YES	2497	10610	2.6	1228	4987	1.8	1269	5623	4.3
NO	99727	393834	96.9	67948	268293	97.7	31779	125591	95.4
UNKNOWN	85	1905	0.5	57	1440	0.5	28	465	0.4
8. MATERNAL DIABETES									
YES	3117	12246	3.0	2289	8883	3.2	828	3363	2.6
NO	99107	392248	96.5	66887	264397	96.2	32220	127851	97.1
UNKNOWN	85	1905	0.5	57	1440	0.5	28	465	0.4
9. MATERNAL HYPERTENSION									
YES	4643	18646	4.6	3111	12403	4.5	1532	6243	4.7
NO	97581	385348	94.9	66065	260877	95.0	31516	124971	94.9
UNKNOWN	85	1905	0.5	57	1440	0.5	28	465	0.4
10. MATERNAL MEDICAL RISK FACTORS#									
ONE OR MORE	24941	93398	23.0	16024	59978	21.8	8917	33420	25.4
NONE	77283	311096	76.5	53152	213302	77.6	24131	97794	74.3
UNKNOWN	85	1905	0.5	57	1440	0.5	28	465	0.4
11. COMPLICATIONS OF LABOR AND/OR DELIVERY									
ONE OR MORE	38495	147241	36.2	25273	95999	34.9	13222	51242	38.9
NONE	63724	257202	63.3	43897	177227	64.5	19827	79975	60.7
UNKNOWN	90	1956	0.5	63	1494	0.5	27	462	0.4

* SEE DEFINITIONS AND FORMULAS.

ANY MEDICAL RISK FACTOR, INCLUDING 7,8, AND 9.

TABLE B.2

ANNUAL AND FOUR-YEAR FETAL DEATHS

1991 AND 1988-91

NORTH CAROLINA

RESIDENT FETAL DEATHS	TOTAL			WHITE			NONWHITE		
	ANNUAL NUMBER	MULTI-YEAR NUMBER	RATE*	ANNUAL NUMBER	MULTI-YEAR NUMBER	RATE*	ANNUAL NUMBER	MULTI-YEAR NUMBER	RATE*
1. TOTAL	884	3566	8.7	465	1826	6.6	419	1740	13.0
SELECTED RISK FACTORS									
2. PRENATAL CARE									
ADEQUATE	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
INTERMEDIATE	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
INADEQUATE	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
UNKNOWN	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
3. HOSPITAL LEVEL									
LEVEL III	361	1517	9.5	179	734	7.3	182	783	13.4
OTHER	523	2049	8.2	286	1092	6.2	237	957	12.7
4. MOTHER SMOKED									
YES	195	817	9.6	117	482	7.8	78	335	14.4
NO	664	2547	8.0	341	1251	5.9	323	1296	11.9
UNKNOWN	25	202	--	7	93	--	18	109	--
5. C-SECTION									
YES	61	328	3.5	39	197	3.0	22	131	4.5
NO	820	3156	10.1	425	1588	7.6	395	1568	15.2
UNKNOWN	3	82	--	1	41	--	2	41	--
6. WEIGHT GAIN									
LESS THAN 15 LBS.	284	1078	32.2	140	520	30.8	144	558	33.7
15 OR MORE LBS.	442	1672	4.7	260	966	3.9	182	706	6.6
UNKNOWN	158	816	--	65	340	--	93	476	--
7. MATERNAL ANEMIA									
YES	33	135	12.6	15	47	9.3	18	88	15.4
NO	846	3357	8.5	449	1742	6.5	397	1615	12.7
UNKNOWN	5	74	--	1	37	--	4	37	--
8. MATERNAL DIABETES									
YES	33	128	10.3	13	68	7.6	20	60	17.5
NO	846	3364	8.5	451	1721	6.5	395	1643	12.7
UNKNOWN	5	74	--	1	37	--	4	37	--
9. MATERNAL HYPERTENSION									
YES	61	252	13.3	31	125	10.0	30	127	19.9
NO	818	3240	8.3	433	1664	6.3	385	1576	12.5
UNKNOWN	5	74	--	1	37	--	4	37	--
10. MATERNAL MEDICAL RISK FACTORS#									
ONE OR MORE	338	1323	14.0	175	669	11.0	163	654	19.2
NONE	541	2169	6.9	289	1120	5.2	252	1049	10.6
UNKNOWN	5	74	--	1	37	--	4	37	--
11. COMPLICATIONS OF LABOR AND/OR DELIVERY									
ONE OR MORE	545	2049	13.7	273	1023	10.5	272	1026	19.6
NONE	334	1450	5.6	191	771	4.3	143	679	8.4
UNKNOWN	5	67	--	1	32	--	4	35	--

* SEE DEFINITIONS AND FORMULAS.

ANY MEDICAL RISK FACTOR, INCLUDING 7,8, AND 9.

TABLE B.3

ANNUAL AND FOUR-YEAR NEONATAL DEATHS

1991 AND 1988-91

NORTH CAROLINA

RESIDENT NEONATAL DEATHS	TOTAL			WHITE			NONWHITE		
	ANNUAL NUMBER	MULTI-YEAR NUMBER	RATE*	ANNUAL NUMBER	MULTI-YEAR NUMBER	RATE*	ANNUAL NUMBER	MULTI-YEAR NUMBER	RATE*
1. TOTAL	715	3050	7.5	347	1499	5.5	368	1551	11.8
SELECTED RISK FACTORS									
2. PRENATAL CARE									
ADEQUATE	441	1757	6.0	252	1045	4.8	189	712	9.9
INTERMEDIATE	144	658	7.8	60	270	6.2	84	388	9.5
INADEQUATE	126	595	19.6	35	172	14.2	91	423	23.3
UNKNOWN	4	40	--	0	12	--	4	28	--
3. HOSPITAL LEVEL									
LEVEL III	385	1700	10.8	175	777	7.7	210	923	16.0
OTHER	330	1350	5.4	172	722	4.1	158	628	8.5
4. MOTHER SMOKED									
YES	165	707	8.4	96	406	6.7	69	301	13.2
NO	537	2250	7.1	244	1047	5.0	293	1203	11.2
UNKNOWN	13	93	--	7	46	--	6	47	--
5. C-SECTION									
YES	169	747	7.9	102	445	6.8	67	302	10.3
NO	545	2254	7.3	245	1035	5.0	300	1219	12.0
UNKNOWN	1	49	--	0	19	--	1	30	--
6. WEIGHT GAIN									
LESS THAN 15 LBS.	250	1027	31.7	98	441	26.9	152	586	36.6
15 OR MORE LBS.	381	1505	4.3	218	850	3.5	163	655	6.1
UNKNOWN	84	518	--	31	208	--	53	310	--
7. MATERNAL ANEMIA									
YES	13	76	7.2	7	28	5.6	6	48	8.5
NO	701	2937	7.5	339	1449	5.4	362	1488	11.8
UNKNOWN	1	37	--	1	22	--	0	15	--
8. MATERNAL DIABETES									
YES	18	82	6.7	9	45	5.1	9	37	11.0
NO	696	2931	7.5	337	1432	5.4	359	1499	11.7
UNKNOWN	1	37	--	1	22	--	0	15	--
9. MATERNAL HYPERTENSION									
YES	33	110	5.9	22	62	5.0	11	48	7.7
NO	681	2903	7.5	324	1415	5.4	357	1488	11.9
UNKNOWN	1	37	--	1	22	--	0	15	--
10. MATERNAL MEDICAL RISK FACTORS#									
ONE OR MORE	299	1256	13.4	151	616	10.3	148	640	19.2
NONE	415	1757	5.6	195	861	4.0	220	896	9.2
UNKNOWN	1	37	--	1	22	--	0	15	--
11. COMPLICATIONS OF LABOR AND/OR DELIVERY									
ONE OR MORE	468	2043	13.9	213	989	10.3	255	1054	20.6
NONE	246	971	3.8	134	491	2.8	112	480	6.0
UNKNOWN	1	36	--	0	19	--	1	17	--

* SEE DEFINITIONS AND FORMULAS.

ANY MEDICAL RISK FACTOR, INCLUDING 7,8, AND 9.

TABLE B.4

ANNUAL AND FOUR-YEAR POSTNEONATAL DEATHS

1991 AND 1988-91

NORTH CAROLINA

RESIDENT POSTNEONATAL DEATHS	TOTAL ANNUAL NUMBER	TOTAL MULTI-YEAR NUMBER	TOTAL MULTI-YEAR RATE*	WHITE ANNUAL NUMBER	WHITE MULTI-YEAR NUMBER	WHITE MULTI-YEAR RATE*	NONWHITE ANNUAL NUMBER	NONWHITE MULTI-YEAR NUMBER	NONWHITE MULTI-YEAR RATE*
1. TOTAL	339	1441	3.6	174	773	2.8	165	668	5.1
SELECTED RISK FACTORS									
2. PRENATAL CARE									
ADEQUATE	189	808	2.8	119	509	2.3	70	299	4.2
INTERMEDIATE	92	407	4.9	39	182	4.2	53	225	5.5
INADEQUATE	57	218	7.3	15	77	6.4	42	141	7.9
UNKNOWN	1	8	--	1	5	--	0	3	--
3. HOSPITAL LEVEL									
LEVEL III	150	657	4.2	66	312	3.1	84	345	6.1
OTHER	189	784	3.2	108	461	2.7	81	323	4.4
4. MOTHER SMOKED									
YES	106	506	6.1	58	314	5.2	48	192	8.5
NO	231	909	2.9	115	446	2.1	116	463	4.4
UNKNOWN	2	26	--	1	13	--	1	13	--
5. C-SECTION									
YES	100	418	4.5	57	236	3.7	43	182	6.3
NO	237	1008	3.3	115	526	2.5	122	482	4.8
UNKNOWN	2	15	--	2	11	--	0	4	--
6. WEIGHT GAIN									
LESS THAN 15 LBS.	60	197	6.3	26	75	4.7	34	122	7.9
15 OR MORE LBS.	257	1102	3.1	136	625	2.6	121	477	4.5
UNKNOWN	22	142	--	12	73	--	10	69	--
7. MATERNAL ANEMIA									
YES	10	58	5.5	5	24	4.8	5	34	6.1
NO	328	1376	3.5	168	744	2.8	160	632	5.1
UNKNOWN	1	7	--	1	5	--	0	2	--
8. MATERNAL DIABETES									
YES	5	39	3.2	4	27	3.1	1	12	3.6
NO	333	1395	3.6	169	741	2.8	164	654	5.2
UNKNOWN	1	7	--	1	5	--	0	2	--
9. MATERNAL HYPERTENSION									
YES	20	75	4.0	9	36	2.9	11	39	6.3
NO	318	1359	3.5	164	732	2.8	154	627	5.1
UNKNOWN	1	7	--	1	5	--	0	2	--
10. MATERNAL MEDICAL RISK FACTORS#									
ONE OR MORE	124	440	4.8	61	224	3.8	63	216	6.6
NONE	214	994	3.2	112	544	2.6	102	450	4.6
UNKNOWN	1	7	--	1	5	--	0	2	--
11. COMPLICATIONS OF LABOR AND/OR DELIVERY									
ONE OR MORE	150	636	4.4	74	326	3.4	76	310	6.2
NONE	188	796	3.1	99	442	2.5	89	354	4.5
UNKNOWN	1	9	--	1	5	--	0	4	--

* SEE DEFINITIONS AND FORMULAS.

ANY MEDICAL RISK FACTOR, INCLUDING 7,8, AND 9.

TABLE B.5

ANNUAL AND FOUR-YEAR INFANT DEATHS

1991 AND 1988-91

NORTH CAROLINA

RESIDENT INFANT DEATHS	TOTAL			WHITE			NONWHITE		
	ANNUAL NUMBER	MULTI-YEAR NUMBER	RATE*	ANNUAL NUMBER	MULTI-YEAR NUMBER	RATE*	ANNUAL NUMBER	MULTI-YEAR NUMBER	RATE*
1. TOTAL	1054	4491	11.1	521	2272	8.3	533	2219	16.9
SELECTED RISK FACTORS									
2. PRENATAL CARE									
ADEQUATE	630	2565	8.8	371	1554	7.1	259	1011	14.0
INTERMEDIATE	236	1065	12.6	99	452	10.4	137	613	15.0
INADEQUATE	183	813	26.8	50	249	20.6	133	564	31.0
UNKNOWN	5	48	--	1	17	--	4	31	--
3. HOSPITAL LEVEL									
LEVEL III	535	2357	14.9	241	1089	10.8	294	1268	22.0
OTHER	519	2134	8.6	280	1183	6.8	239	951	12.8
4. MOTHER SMOKED									
YES	271	1213	14.5	154	720	11.8	117	493	21.6
NO	768	3159	9.9	359	1493	7.1	409	1666	15.5
UNKNOWN	15	119	--	8	59	--	7	60	--
5. C-SECTION									
YES	269	1165	12.4	159	681	10.5	110	484	16.6
NO	782	3262	10.6	360	1561	7.5	422	1701	16.7
UNKNOWN	3	64	--	2	30	--	1	34	--
6. WEIGHT GAIN									
LESS THAN 15 LBS.	310	1224	37.8	124	516	31.5	186	708	44.2
15 OR MORE LBS.	638	2607	7.4	354	1475	6.0	284	1132	10.6
UNKNOWN	106	660	--	43	281	--	63	379	--
7. MATERNAL ANEMIA									
YES	23	134	12.6	12	52	10.4	11	82	14.6
NO	1029	4313	10.9	507	2193	8.2	522	2120	16.9
UNKNOWN	2	44	--	2	27	--	0	17	--
8. MATERNAL DIABETES									
YES	23	121	9.9	13	72	8.1	10	49	14.6
NO	1029	4326	11.0	506	2173	8.2	523	2153	16.8
UNKNOWN	2	44	--	2	27	--	0	17	--
9. MATERNAL HYPERTENSION									
YES	53	185	9.9	31	98	7.9	22	87	13.9
NO	999	4262	11.0	488	2147	8.2	511	2115	16.9
UNKNOWN	2	44	--	2	27	--	0	17	--
10. MATERNAL MEDICAL RISK FACTORS#									
ONE OR MORE	423	1696	18.2	212	840	14.0	211	856	25.6
NONE	629	2751	8.8	307	1405	6.6	322	1346	13.8
UNKNOWN	2	44	--	2	27	--	0	17	--
11. COMPLICATIONS OF LABOR AND/OR DELIVERY									
ONE OR MORE	618	2679	18.2	287	1315	13.7	331	1364	26.6
NONE	434	1767	6.9	233	933	5.3	201	834	10.4
UNKNOWN	2	45	--	1	24	--	1	21	--

* SEE DEFINITIONS AND FORMULAS.

ANY MEDICAL RISK FACTOR, INCLUDING 7,8, AND 9.

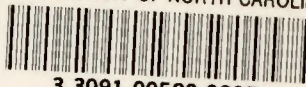
APPENDIX C

Lower Section of the Certificate of Live Birth

INFORMATION FOR MEDICAL AND HEALTH USE ONLY

FATHER 26a. SSN: _____ 26b. EDUCATION (Highest Grade Completed) Elementary/Secondary (0-12) _____ College (1-4 or 5+) _____ 26c. HISPANIC (Cuban, Mexican, Puerto Rican, etc.) ORIGIN? <input type="checkbox"/> No <input type="checkbox"/> Yes (Specify) _____		MOTHER 27a. SSN: _____ 27b. EDUCATION (Highest Grade Completed) Elementary/Secondary (0-12) _____ College (1-4 or 5+) _____ 27c. HISPANIC (Cuban, Mexican, Puerto Rican, etc.) ORIGIN? <input type="checkbox"/> No <input type="checkbox"/> Yes (Specify) _____					
MOTHER MARRIED (At birth, conception or between birth and conception) 28. _____		PLURALITY — Single, Twin, Triplet, etc. (Specify) 29a. _____	IF NOT SINGLE — Born First, Second, Third, etc. (Specify) 29b. _____				
30. PREGNANCY HISTORY (Complete each section) a. Live Births (Do not include this child) Now Living, Number _____ <input type="checkbox"/> None Now Dead, Number _____ <input type="checkbox"/> None Date of last Live Birth (Month, Day, Year) _____		31. APGAR SCORE <table border="1"> <tr> <th>1 MIN</th> <th>5 MIN</th> </tr> <tr> <td> </td> <td> </td> </tr> </table>		1 MIN	5 MIN		
1 MIN	5 MIN						
b. OTHER TERMINATIONS (Spontaneous and induced at any time after conception) Number _____ <input type="checkbox"/> None DATE OF LAST OTHER TERMINATION (Month, Day, Year) _____		DATE LAST NORMAL MENSES BEGAN (Month, Day, Year) _____ 32. _____					
MONTH OF PREGNANCY PRENATAL CARE BEGAN (First, Second, etc.) _____ 33. _____		PRENATAL VISITS — Total Number (If none, so state) 34. _____	CLINICAL ESTIMATE OF GESTATION (Weeks) 35. _____				
MOTHER TRANSFERRED PRIOR TO DELIVERY? <input type="checkbox"/> NO <input type="checkbox"/> YES If yes, enter name of facility transferred from _____ 37a. _____		INFANT TRANSFERRED? <input type="checkbox"/> NO <input type="checkbox"/> YES If yes, enter name of facility transferred to _____ 37b. _____					

38a. MEDICAL HISTORY FOR THIS PREGNANCY (Check all that apply) Anemia (Hct. < 30/Hgb. < 10) 01 <input type="checkbox"/> Cardiac disease 02 <input type="checkbox"/> Acute or chronic lung disease 03 <input type="checkbox"/> Diabetes 04 <input type="checkbox"/> Genital herpes 05 <input type="checkbox"/> Hydramnios/Oligohydramnios 06 <input type="checkbox"/> Hemoglobinopathy 07 <input type="checkbox"/> Hypertension, chronic 08 <input type="checkbox"/> Hypertension, pregnancy-associated 09 <input type="checkbox"/> Eclampsia 10 <input type="checkbox"/> Incompetent cervix 11 <input type="checkbox"/> Previous infant 4000+ grams 12 <input type="checkbox"/> Previous preterm or small-for-gestational-age infant 13 <input type="checkbox"/> Renal disease 14 <input type="checkbox"/> Rh sensitization 15 <input type="checkbox"/> Uterine bleeding 16 <input type="checkbox"/> None 00 <input type="checkbox"/> Other (Specify) 17 <input type="checkbox"/>	40. EVENTS OF LABOR AND/OR DELIVERY (Check all that apply) Febrile (> 100° F. or 38° C.) 01 <input type="checkbox"/> Meconium, moderate/heavy 02 <input type="checkbox"/> Premature rupture of membrane (> 12 hours) 03 <input type="checkbox"/> Abruptio placenta 04 <input type="checkbox"/> Placenta previa 05 <input type="checkbox"/> Other excessive bleeding 06 <input type="checkbox"/> Seizures during labor 07 <input type="checkbox"/> Precipitous labor (< 3 hours) 08 <input type="checkbox"/> Prolonged labor (> 20 hours) 09 <input type="checkbox"/> Dysfunctional labor 10 <input type="checkbox"/> Breech/Malpresentation 11 <input type="checkbox"/> Cephalopelvic disproportion 12 <input type="checkbox"/> Cord prolapse 13 <input type="checkbox"/> Anesthetic complications 14 <input type="checkbox"/> Fatal distress 15 <input type="checkbox"/> None 00 <input type="checkbox"/> Other (Specify) 16 <input type="checkbox"/>	43. CONGENITAL ANOMALIES OF CHILD (Check all that apply) Anencephalus 01 <input type="checkbox"/> Spina bifida/Meningocele 02 <input type="checkbox"/> Hydrocephalus 03 <input type="checkbox"/> Microcephalus 04 <input type="checkbox"/> Other central nervous system anomalies (Specify) 05 <input type="checkbox"/> Heart malformations 06 <input type="checkbox"/> Other circulatory/respiratory anomalies (Specify) 07 <input type="checkbox"/> Rectal atresia/stenosis 08 <input type="checkbox"/> Tracheo-esophageal fistula/Esoophageal atresia 09 <input type="checkbox"/> Omphalocele/Gastroschisis 10 <input type="checkbox"/> Other gastrointestinal anomalies (Specify) 11 <input type="checkbox"/> Malformed genitalia 12 <input type="checkbox"/> Renal agenesis 13 <input type="checkbox"/> Other urogenital anomalies (Specify) 14 <input type="checkbox"/> Cleft lip/palate 15 <input type="checkbox"/> Polydactyly/Syndactyly/Adactyly 16 <input type="checkbox"/> Club foot 17 <input type="checkbox"/> Diaphragmatic hernia 18 <input type="checkbox"/> Other musculoskeletal/integumental anomalies (Specify) 19 <input type="checkbox"/> Down's syndrome 20 <input type="checkbox"/> Other chromosomal anomalies (Specify) 21 <input type="checkbox"/> None 00 <input type="checkbox"/> Other (Specify) 22 <input type="checkbox"/>
38b. OTHER HISTORY FOR THIS PREGNANCY (Complete all items) Tobacco use during pregnancy Yes <input type="checkbox"/> No <input type="checkbox"/> Average number cigarettes per day Alcohol use during pregnancy Yes <input type="checkbox"/> No <input type="checkbox"/> Average number of drinks per week Weight gained during pregnancy lbs.	41. METHOD OF DELIVERY (Check all that apply) Vaginal 01 <input type="checkbox"/> Vaginal birth after previous C-section 02 <input type="checkbox"/> Primary C-section 03 <input type="checkbox"/> Repeat C-section 04 <input type="checkbox"/> Forceps 05 <input type="checkbox"/> Vacuum 06 <input type="checkbox"/>	
39. OBSTETRIC PROCEDURES (Check all that apply) Amniocentesis 01 <input type="checkbox"/> Electronic fetal monitoring 02 <input type="checkbox"/> Induction of labor 03 <input type="checkbox"/> Stimulation of labor 04 <input type="checkbox"/> Tocolysis 05 <input type="checkbox"/> Ultrasound 06 <input type="checkbox"/> None 00 <input type="checkbox"/> Other (Specify) 07 <input type="checkbox"/>	42. CONDITIONS OF THE NEWBORN (Check all that apply) Anemia (Hct < 39/Hgb < 13) 01 <input type="checkbox"/> Birth injury 02 <input type="checkbox"/> Fetal alcohol syndrome 03 <input type="checkbox"/> Hyaline membrane disease/RDS 04 <input type="checkbox"/> Meconium aspiration syndrome 05 <input type="checkbox"/> Assisted ventilation < 30 min. 06 <input type="checkbox"/> Assisted ventilation ≥ 30 min. 07 <input type="checkbox"/> Seizures 08 <input type="checkbox"/> None 00 <input type="checkbox"/> Other (Specify) 09 <input type="checkbox"/>	



APPENDIX D

**Minimum and Maximum Recommended Weight Gain
For Normal Weight Women For Each Week of Gestation**

<u>Week of Gestation</u>	<u>Weight Minimum</u>	<u>Weight Maximum</u>
13	3.5	3.5
20	9	12
21	10	13
22	11	14
23	12	15
24	12	16
25	13	18
26	14	19
27	15	20
28	16	21
29	16	22
30	17	23
31	18	25
32	19	26
33	20	27
34	20	28
35	21	29
36	22	30
37	23	32
38	24	33
39	24	34
40	25	35

Source: Institute of Medicine, Nutrition During Pregnancy, National Academy Press, 1990.

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